9th Saint Petersburg International Conference on Integrated Navigation Systems

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SRC RF – CSRI Elektropribor, 30, Malaya Posadskaya St., Saint Petersburg, Russia
Central Scientific and Research Institute (CSRI) "Elektropribor"
phone +7 (812) 232-59-15 fax + 7 (812) 232 3376 email elprib@online.ru
http://www.elektropribor.spb.ru/index.html

CDR Christopher L. Butler, USN
Office of Naval Research International Field Office - Europe
Ocean, Atmosphere and Space S&T Focus Area
223 Old Marylebone Road, London NW1 5TH
Tel. 44-171-514-4948, Fax. 44-171-514-4980
Email: mcm@onrifo.navy.mil
http://www.onrifo.navy.mil

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SO/SR - Conference Report News Headlines

New analytical approaches result in improved position accuracy for Global Navigation Satellite Systems, Integrated Navigation systems, and Inertial Systems and sensors.

EXECTIVE SUMMARY OF SCIENTIFIC / TECHNICAL RESULTS

The sessions of this annual Conference were arranged on three topics: *"Satellite systems"(15* papers), *"Integrated systems"(42* papers), and *"Inertial systems and sensors"(*23 papers). 80 papers including 35 plenary and 45 poster papers were presented at the Conference. Of note, the conference involved 173 attendees, with specialists from 23 countries; approximately 80% of the total papers presented were by countries from the former Eastern Block (primarily Russia and Ukraine). No new capabilities for future Naval Systems were revealed, however, papers presented in all three sections illustrated new analytical approaches that resulted in improvements in position accuracy for Global Navigation Satellite Systems (GNSS), integrated navigation systems, and inertial systems and sensors**.**

SCIENTIFIC PROGRAM

For final agenda, list of lectures, titles, authors, poster/exhibition sessions see:
http://www.elektropribor.spb.ru/confs/icins02/app1.html .

TRENDS AND HIGHLIGHTS

Papers in the ***"*Satellite systems"** section were dominated by Russian and German Scientists, and centered on trends of improvements and developments / applications for Global Navigational Satellite Systems in Space vehicle positioning/stationing**.** Advances in position accuracy presented by Russian Scientists, resulted from the approaches and techniques utilizing higher order math and physics (e.g., **statistical processing** for signal filtering, solution of phase ambiguity using **angle of signal arrival estimates**). Approaches and techniques for tracking sub-orbital and space vehicles, as well as precision navigation and positioning using **GPS and GALILEO** were the primary focus presented by German Scientists. From these approaches and techniques, researchers were also able to establish algorithms for environmental impacts from the upper atmosphere, such as ***Estimation of Ionospheric Delay*** *by Single Frequency GLONASS and GPS Measurements*, and *Simulation* ***of Tropospheric and Antenna Effects*** *on Satellite Navigation Signal*s.

Papers in the **"Integrated Systems**" section focused on algorithm development and integrated signal processing for tracking and positioning, as well as inertial navigation systems and alternate technologies for areas where GPS is limited (i.e. digital magnetic and fiber optic gyros, gravimetric systems, and pseudolites). Of note, several innovative approaches (Swiss and German) in the development of **Pedestrian Navigation systems** which looked at digital magnetic compass, imagery/photo matching, and gyroscope integration for navigation in areas where GPS was limited or denied. Further development is required to compensate for magnetic interference from surrounding metal objects found in urban and shipboard environments. Development continues in GPS pseudolites (ground-based "pseudo-satellites") for specialized GPS applications requiring signal augmentation**.** Most current applications of pseudolites have required fairly in-depth GPS technical skill to properly incorporate pseudolite technology. Papers presented revealed a more integrated line of systems products (i.e., local navigation integrated GNSS & pseudolites and GPS augmentation systems /Pseudo "GPS" location networks). Related to this effort, discussion with conference attendees revealed an **innovated approach for pseudolite stationing utilizing the Helikites** from ALLSOPP HELIKITES LTD, a U.K. company. The Helikite is a helium balloon and kite configuration that can be used for line of sight GPS transmission, while maintaining station (within a defined wash circle 5000-12000 feet above ground) in up to 50 knots winds.

To the right is a photo of the ALLSOPP HELIKITES SKYHOOK UAV, the latest Military aerostat for photography, video, radio, position marking and towing

Another effort of note is that STN ATLAS Elektronik GmbH Naval Systems, Bremen, Germany is working on **vehicle model based navigation filter for a new autonomous underwater vehicle Deep C**. Their approach is not unique in itself (ONR has several programs researching navigation for UUVs), but STN ATLAS' efforts are in developing a low cost/effective design/system.

Russian presenters dominated the papers in the "**Inertial Systems And Sensors"** section, presenting 19 out of the 23 papers in this section, with a pervasive focus on Gyro technology. The majority of the papers centered on improvements in gyro accuracy (low cost, lower end gyros), particularly Fiber Optic Gyroscopes, and micromechanical gyros, and gyrocompasses. Other major themes presented were developments/applications of dead reckoning systems and precision quartz accelerometers.

PROCEEDINGS

The Conference Proceedings were published (ISBN 5-900780-37-6- edition in English). To purchase the Conference Proceedings, make request to the CSRI address above.

ASSESSMENT

The low turnout by Western European and North America participants could be attributed to two factors; the European Navigation Conference – GNSS 2002 in Copenhagen took place during the same time period as the Saint Petersburg Conference, and the perception that there is a lack of clarity on what can and cannot be discussed between NATO nations, and the Former USSR. ONRIFO should consider revisiting this particular conference in 2 years to assess new trends in Space and Navigation technologies. The 10th Saint Petersburg International Conference on Integrated Navigation Systems is scheduled for 26 - 28 May 2003.

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